REMARKS

Applicants appreciate the thoroughness with which the Examiner has examined the above-identified application. Reconsideration is requested in view of the remarks below.

Claims 1-10 and 20-28 stand rejected under 35 USC § 103 as being obvious from Santiago U.S. Patent No. 6,716,287 ("Santiago '287") in view of Luo et al. U.S. Patent Publication No. 2003/0059535 ("Luo '535"). Applicants respectfully traverse this rejection.

Applicants' invention as described in independent claims 1 and 8 recites that, at the first chamber volume, there is a reaction of the precursor with the substrate to deposit the layer and that the reaction chamber is subsequently enlarged to a second, larger chamber volume to reduce the concentration of the precursor and remove undeposited precursor to end reaction of the precursor. Claim 8 also recites a second precursor reaction that is also enlarged from the first chamber volume to the second chamber volume.

Santiago '287 discloses a processing chamber useful for chemical vapor deposition (CVD). CVD is generally employed to deposit a thin film on a substrate or semiconductor wafer and is generally accomplished by introducing a precursor gas into a vacuum chamber. The precursor gas is typically directed through a showerhead or other inlet situated near the top of the chamber. The precursor gas reacts to form a layer of material on the surface of the substrate that is positioned on a heated substrate support. Column 1, lines 38-44. The CVD chamber includes support assembly that is disposed beneath the showerhead, and which supports a substrate during processing.

The support assembly is further described as follows in one of the portions of Santiago '287 cited by the Examiner:

> The support assembly 138 is coupled to a lift mechanism 144 by a shaft 126. The lift mechanism 144 enables the support assembly 138 to be moved between an upper position proximate the showerhead 118 as shown in FIG. 1 and a lower position that facilitates substrate transfer between the support assembly 138 and a robot (not shown). Bellows 146 provide a vacuum seal between the process volume 112 and the atmosphere outside the chamber 100 while facilitating the movement of the support assembly 138.

Column 3, lines 53-65. The CVD process is only vaguely described, with emphasis on improving gas flow within the chamber. All of the drawing figures show the chamber in the upper, raised position proximate the showerhead, and Santiago '287 discloses no process in which a precursor remains in the reaction chamber as the support assembly is lowered. By the aforementioned description, Santiago '287 suggests only that the support assembly is lowered for the purpose of "transfer between the support assembly 138 and a robot" and not during deposition processing itself. Accordingly, there is no disclosure or suggestion of applicant's method of enlarging the reaction chamber to a second, larger volume to reduce concentration of the first precursor and removing undeposited first precursor to end reaction of the first precursor.

The Luo '535 reference discloses the cyclic deposition of films in a process chamber. In a passage cited by the Examiner, one embodiment of the process is described:

> This method of one embodiment for SiN deposition is accomplished with an alternating flow of the two reactive gasses under careful process controls. The flow of ammonia can first be applied onto the wafer surface and then stopped, where the wafer surface can be pre-heated to approximately 500°C. Residual ammonia and N-containing reactive species in the process chamber can be removed by pump and purge. A flow of HCD can then be applied to the wafer still heated to approximately 500°C. and the flow then stopped. The flow of HCD and

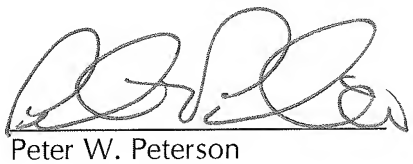
> ammonia reactive gasses can be continued to alternately apply each half layer until a final film thickness is achieved. Each flow step can be followed by a pump only, a purge only or a pump step coupled with a purge with the wafer temperature maintained at approximately 500°C. throughout the process.

Paragraph 0036. Luo '535 does not describe any change in chamber volume, nor any mechanism for changing the chamber volume, during either the deposition process or even afterwards during the pump or purge stage. Luo '535 shows no recognition of applicants' improved deposition process that uses a variable chamber volume while the precursor is still in contact with the substrate to reduce concentration and end the reaction.

Since neither Santiago '287 nor Luo '535 describe a reaction with a precursor to deposit a layer that takes place during enlargement of a reaction chamber from the a chamber volume to a second, larger chamber volume, the present invention is not *prima facie* obvious from a combination of these references. Both references lack any teaching or suggestion of reducing concentration of a precursor and removing undeposited first precursor to end reaction thereof by enlarging the reaction chamber from a first volume to a second, larger volume. The only suggestion of doing so is from applicants' own specification, which therefore represents impermissible hindsight analysis.

It is respectfully submitted that the application is in a condition where allowance of the entire case is proper. Reconsideration and issuance of a notice of allowance are respectfully solicited.

Respectfully submitted,



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